



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

III. *Observations tending to prove, by Phænomena and Scripture, the Existence of an Orb, which surrounds the whole visible material System ; and which may be necessary to preserve it from the Ruin, to which, without such a Counterbalance, it seems liable by that universal Principle in Matter, Gravitation.*

By JAMES BOWDOIN, Esquire,  
President of the American Academy of Arts and Sciences.

AT the conclusion of a memoir, entitled, “ Observations on Light, &c.” which I have had the honour to lay before the Academy, it was intimated, that there are phenomena in nature, and other evidence, tending to prove the existence of an orb, that surrounds the whole visible material system.

The evidence is,—phenomena and scripture.

The phenomena are,—the luminous girdle in the blue expanse, called the Milky Way ;—other luminous appearances in it ; and the expanse itself.

In regard to the luminous girdle, or Milky Way.—This phenomenon has been supposed to result from the combined lustre of infinite multitudes of stars, too distant to be distinctly visible. But although it be observed through telescopes, that there is a great number of stars in the Milky Way, on which circumstance the supposition is founded, they appear as stars set in it ; distinguishable from it ; and not contributing to form the phenomenon.

The supposition not only disagrees with the appearance, but is inconsistent with every philosophical idea concerning those stars. They are represented to be suns : each having its system

tem of planets revolving round it ; and consequently requiring a space proportioned to their number, and the extent of their systems : which space, for such multitudes of them as the supposition implies, must be beyond conception immense : and through which they must therefore be dispersed at such distances, that comparatively few of them could be visible by us ; and that the whole together could not blend their light to cause that phenomenon.

On the contrary, the phenomenon strikes us, as it may be supposed such a luminous girdle would strike, if its light were reflected from the concave surface of a far distant orb : to which, on the hypothesis assumed, it had been propelled from the numerous systems, which the orb enfolds.

The same idea is suggested by the different degrees of its light, from a small light to a faint scarcely discernible one ; by the frequent interruptions of it ; and by the large chasm, which for a considerable space, makes the girdle appear double, and very irregular.

These appearances may be occasioned by the situation of the earth in respect to those parts of the orb, from which certain cones of light (presently to be explained) are reflected ; and by the particular construction, and configuration of those parts ; by means of which those cones are broken, and irregularly reflected to the earth : whose different situations in its orbit, by reason of its great distance from the orb, would occasion no sensible difference in the appearance.

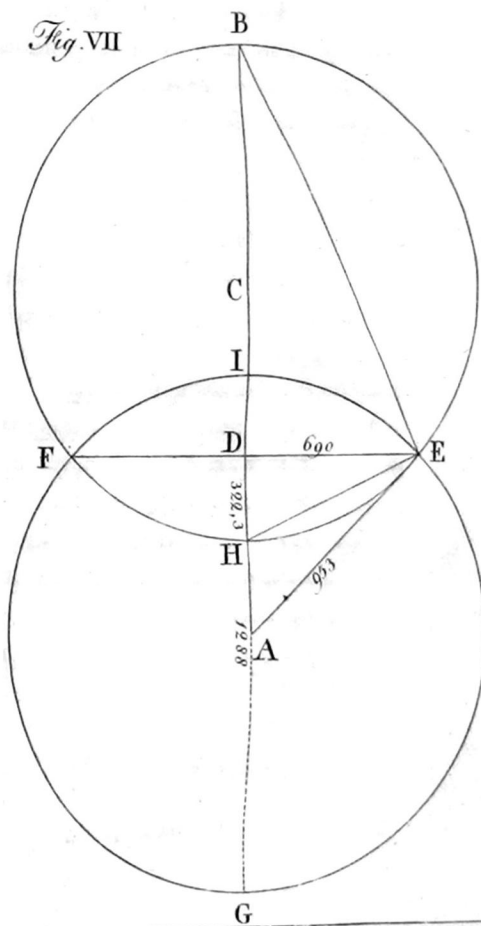
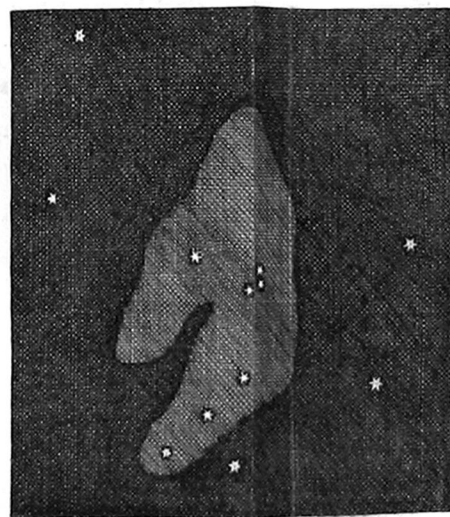
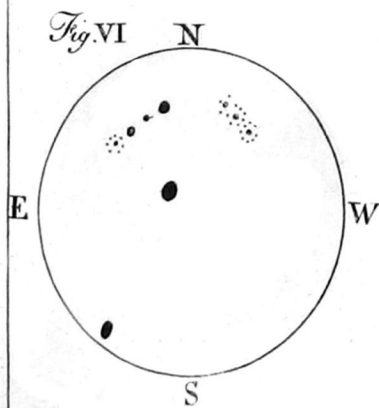
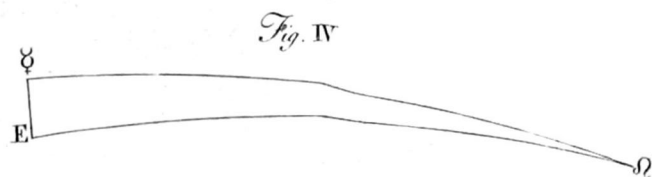
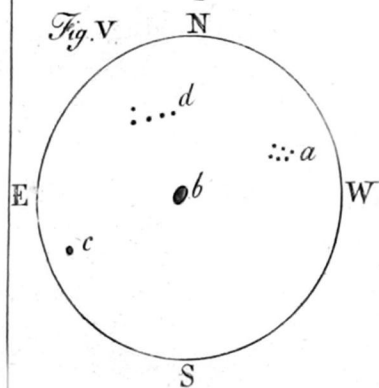
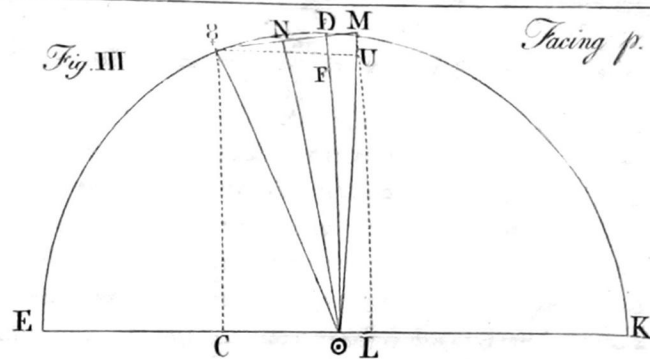
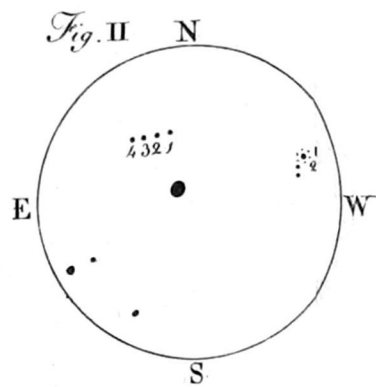
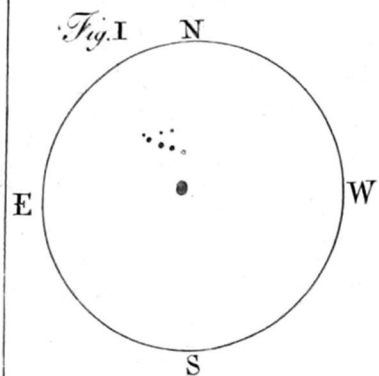
With respect to the other luminous appearances in the concave expanse, I beg leave here to introduce several observations, upon that subject, from two authors, who have distinguished themselves in the astronomical branch of science.

One of them, Dr. *Smith*, in his *System of Optics*,\* observes, that “*Hugenius*, in the year 1656, looking by chance through a large telescope, at three small stars, very close to one another, in the middle of Orion’s Sword, saw several more as usual. But the three little stars very near one another, (marked  $\theta$  by *Bayer*) together with four more, shone out as it were through a whitish cloud, much brighter than the ambient sky : which being very black, caused that lucid part to appear like an aperture, which gave a prospect into a brighter region. He viewed it many time, and found it continued in the very same place, and of the same shape as the figure represents ; [See plate II. fig. 8.] and called it *Protentum cui certe simile aliud nusquam apud reliquas fixas potuit animadvertere.*”

He also observes, that “in the *Philosophical Transactions*,† there is an account of a later discovery of five more such lucid spots, though less considerable than this of *Hugenius* ; the middle of which, we are there told, is at present in  $\pi$ .  $19^{\circ} 00'$ , with south latitude  $28^{\circ} 45'$  ; and that it sends forth a radiant beam into the south-east, as another in the girdle of *Andromeda* seems to do into the north-east. It is also there remarked, that though these spots are in appearance but small, and most of them but a few minutes in diameter ; yet, since they are among the fixt stars, as having no annual parallax, they cannot fail to occupy spaces immensely great ; and, perhaps, not less than our whole solar system : in all which spaces, it should seem, that there is a perpetual uninterrupted day.”

The

\* P. 447—8.



The other author, Mr. *Ferguson*, speaking of the Milky Way, says, † “ There is a remarkable tract round the heavens, called *the Milky Way* from its peculiar whiteness, which was formerly thought to be owing to a vast number of very small stars therein : but the telescope shews it to be quite otherwise ; and therefore *its whiteness must be owing to some other cause*. This tract appears single in some parts, in others double.”

“ There are several little whitish spots in the heavens, which appear magnified, and more luminous, when seen through telescopes ; yet *without any stars in them*.” Five of which spots he particularly mentions.

He next observes, that “ cloudy stars are so called from their misty appearance. They look like *dim stars* to the naked eye : but through a telescope, they *appear broad illuminated parts of the sky* ; in some of which is one star, in others more.—But the most remarkable of all the cloudy stars, is that in the middle of Orion’s Sword, where seven stars (of which, three are very close together) seem to shine through *a cloud very lucid near the middle*, but faint and ill-defined about the edges. It looks like *a gap in the sky*, through which one may see, as it were, *part of a much brighter region*.”

These quotations, without making any comment upon them, shew, that the Milky Way is not owing to the stars contained in it ; that the telescope shews it to be quite otherwise ; and that it must be owing to some other cause : that in respect to the lucid spots, in some of them there are no stars ; in others but few ; and that one of them exhibits a remarkable appearance of an aperture, or gap, that gave a prospect into a brighter region : that the spaces they occupy, though small in appear-

ance, are, perhaps, not less than our whole solar system ; and that in them it should seem there is perpetual uninterrupted day.

From these phenomena it seems not improbable, that the Milky Way, and those lucid spots, are parts of a concave body or orb, of the same nature with some of the other heavenly bodies ; and, whose light, transmitted to us, exhibits those phenomena, according to the laws and circumstances, which regulate it.

There is another, and still more remarkable phenomenon, that suggests the idea of such an orb : I mean the blue concave expanse, which surrounds, and appears to limit visible nature ; and which is the last to be considered.

It is thus explained by Sir *Isaac Newton* ; who observes, “ that all the vapours, when they begin to condense and coalesce into natural particles, become first of such a bigness as to reflect the azure rays, ere they can constitute *clouds* of any other colour. This, therefore, being the first colour they begin to reflect, must be that of the finest and most transparent skies : in which the vapours are not arrived to a grossness sufficient to reflect other colours.”\*

By this explanation it appears, that the cause of this phenomenon exists within the earth's atmosphere. If it really doth exist within it, the phenomenon, from the assigned cause of it, seems to be nothing more than a blue transparent cloud, more or less extensive, in proportion as the atmosphere may happen to be less or more charged with other clouds.

If this were the cause, would not the heavenly bodies, in a clear sky, partake of the colour of that cloud, and appear blue, or be tinged with it, by means of their light passing through  
the

\* *Chambers's Cyclopædia*, under the word *Blueness*.

the blue cloud ? And would not this appearance indicate, that the blue rays of their light were transmitted, and the other coloured rays, for the most part, reflected from the atmosphere ? Would not that transmission of the blue rays occasion all bodies around us to appear blue, so long as the atmosphere, continuing clear, should exhibit the blue cloud ? And would not the colours of those bodies vary as other coloured clouds should succeed and predominate ?

Would not this reflection of the other coloured rays occasion, not only a decrease of light, but, with respect to the sun, a great diminution of its heat ? If the several different coloured rays do each, in respect to heat, produce an equal effect ; and all but the blue rays are reflected, should we not, in a clear day, be deprived of six sevenths, or a proportionable part, of the sun's heat, which the seven sorts of rays, had they been all transmitted, would have afforded ?

Such appearances and effects might have been expected, if the assigned cause produced the phenomenon : for the sun's light and other light, and also bodies in general, whatever be their colour, being viewed through a medium of any original colour, will appear of that colour, or strongly tinged with it. But it is apprehended, that no such appearances and effects have ever been observed ; and, therefore, that there is reason to doubt the reality of the cause assigned : the insufficiency of which may further appear in the course of these observations.

But how is the existence of the orb deduced from the phenomenon ?—In the same manner as the existence of the other heavenly bodies, and the existence of the bodies around us are deduced : namely, from the uniformity and permanency of their visible qualities, or phenomena.



In regard to bodies around us, whenever by sight we have been impressed with certain ideas of colour, form, and magnitude, corresponding to bodies near us, and at an approachable distance, we have found, by constant and uniform experience, derived also from, and confirmed by, every other sense and means of information, that such bodies do really exist : and having thus from experience gained the knowledge, that certain phenomena do infallibly indicate the existence of those bodies, the phenomena themselves do then alone become the undisputed evidence of that existence.

Nature is simple and uniform in its operations. From the same cause follow like effects ; and these indicate the same cause. Bodies of every kind, through the medium of light, produce their respective phenomena, and these demonstrate the reality of those bodies.

From these principles we infer the reality of those terrestrial bodies, which, by reason of their situation and distance, can only be the objects of sight : and from the same principles we also infer the reality of the heavenly bodies, the planets, and fixed stars. If this last inference be just, is it not equally just to infer, from the same principles, the reality of the blue circumambient expanse : that is, that it is a real concave body, encompassing all visible nature : which is the exact description of the concave surface of the orb above-mentioned.

There is one appearance of the blue expanse, which may be thought to militate with the foregoing account of it.

In a clear day, it appears of a brighter blue than in the night, occasioned by the sun's light reflected to us by the earth's atmosphere. From which circumstance it might be supposed, that the cause of the phenomenon doth exist within the atmosphere,

phere, and is the atmosphere itself, or its vapour. It is apprehended, however, that this would be a mistaken supposition ; and that the appearance may be explained on principles, which will not only invalidate the supposition, but further shew the insufficiency of the cause, to which the phenomenon has been ascribed.

For that purpose it may be observed, that the atmosphere being invisible, must be without colour ; and has, perhaps for that reason, no greater disposition to transmit or reflect to us the blue rays of light, whether of the sun or stars, than those of the other colours : and, therefore, if the phenomenon be produced by means of the blue rays of those luminaries (which I shall attempt to explain) the atmosphere cannot be the cause of that production.

With respect to the vapours in the atmosphere, which, in a particular state, are said to occasion the phenomenon, they being of different degrees of grossness or density, must arrange themselves according to that density, or their specific gravity. If then any of the ranges consisted of vapour, in a proper state to transmit or reflect to the eye the blue rays only, the effect of it would be destroyed, or changed, by the grosser vapour in the lower range. Or if it should so happen (which seems very improbable) that the whole body of vapour should consist of particles of the due size, and in the proper state, to reflect the blue rays, it could not long continue in that state, by reason of the changeable nature of the vapour, and the numerous causes, that are constantly operating to produce a change in it. But the phenomenon is uniform and premanent ; and therefore must be the effect of an uniform and permanent cause.

If these observations have any foundation, neither the atmosphere nor its vapour, assisted by, or assisting, the *direct* light of the sun and stars, can be the cause of the phenomenon.

The atmosphere, however, or its finer and transparent vapour, contributes to the brighter hue of the phenomenon by day : which may be thus explained.

The sun's light in its mixt state, reflected by the atmosphere, or by the transparent vapour floating in it, enters the eye at the same time with the blue light of the expanse ; and both together delineate on the retina an image, formed by their united rays, each producing its effect. The light from the expanse exhibiting the blue image ; the light from the sun illuminating or brightening the image ; and both together impressing the idea of that phenomenon, as it is displayed in a clear day.

If it should be asked, from whence the concave expanse derives its light, the answer is—from the numberless planetary or solar systems, which it includes : and particularly from those in the neighbourhood of it, which directly answer the purpose of enlightening, and in other respects, accommodating its inhabitants.

This light, transmitted to the expanse through its atmosphere, is reflected back directly and indirectly to the systems from which it issued : to be again, in a due succession, remitted to, and reflected from, the expanse. By such a reciprocation, and mutual interchange of light with each other, and among themselves, the several parts may be supplied with the quantity they had respectively emitted ; and the equilibrium of the whole maintained : whereby the evils, that might otherwise ensue from the waste, or undue distribution of its matter, and the consequent alteration of its gravitation, might be prevented.

To

To different systems, according to their situations, the expanse may exhibit very different phenomena. Although to our system, or to us on this planet, it exhibits the blue concave of an all-surrounding orb ; which, in the Milky Way, and in some other parts of it, shines with a brighter light, it may to other systems appear of other colours ; and exhibit to some of them in succession, according to their situations, the several primitive colours in the order, in which the rays of those colours are separated and classed.

Of one of these exhibitions, that of the blue colour, we have ocular demonstration. But why should the expanse appear to us blue, rather than green, or of any other primitive colour ? If that appearance can be explained by the refrangibility of light, or by the separation of it into its several colours, as perhaps it can, the other appearances of the expanse to other systems, naturally, if not necessarily, follow.

Experiments prove, that light is compounded of differently coloured rays ; and that after it has past through different mediums properly disposed, the rays are refracted, or separated and classed, according to their different refrangibility ; and shew those colours in the order just mentioned : that the three most refrangible of them, the blue, the indigo, and violet, which possess one half of the space spread over by the whole, are so nearly allied in colour, that the last, when considerably spread, are scarcely to be distinguished from the neighbouring blue : for which reason, those three classes appear as one, at a great distance from the refracting medium : and the blue thus circumstanced, and uniting those classes, may therefore be said to possess a space equal to the space occupied by all the rest. That from any segment of a hollow sphere, such, for instance, as a

concave mirror, whose arc does not exceed fifteen or eighteen\* degrees; the cylinder of rays falling upon it parallel to its axis, will, if there be no refraction, be reflected to a focus round that axis: the focus being nearly equidistant from the pole of the segment, and the centre of its sphere: and that those rays, if previously refracted, and classed into their several colours, will, in their divergence from the focal point, shew those colours in a reversed order: the refraction, however, occasioning an alteration in the position of the focus, and the diverging cone.

To apply some of these observations, it may be supposed, that the interior side of the expanse has, in general, an uniform surface, which may be conceived as composed of a multitude of segments, each of them not exceeding a given arch: that it is furnished with an atmosphere, possessing, in some peculiar mode, the power of refracting light, of distributing its rays into their respective classes, and transmitting them to the expanse; which also may be conceived as assisting, by its reflecting power, in their classification: that the transmitted rays would, in their classed state, be reflected from it in all directions; and that such of them (by far the greatest † part of the whole) as should

come

\*s. *Gravesande's Natural Philosophy*. Book III. ch. xv. prop. 813.

† That these parallel rays (parallel, I mean, to any and every conceivable diameter-line of the expanse) must constitute the greatest quantity or proportion of the reflected light, will be manifest from these considerations:—That they come to every segment or part of the expanse from the opposite part of it, and from the systems situated between such opposite parts: that the distance of any two opposite parts from each other, equal to the diameter of the expanse, is the greatest that can take place within it: that there must, therefore, be, in the space between them, a greater number of systems supplying the expanse with light, than there can be in

any

come to the atmosphere in parallel lines, or in cylinders, whose axes were diameter-lines of the expanse, and whose bases were equal to those segments, would pass through the atmosphere to the corresponding segments of the expanse, and be reflected from them ; and afterwards, in the same classed state, unite in a focus, from which they would diverge, and exhibit their several colours.

To give some idea, though an imperfect one, of that focus, the reflection and convergence may be conceived as made (somewhat in the manner above-represented) from the segments composing the whole surface of the expanse : that each segment would reflect a cone of rays, terminating in a focus ; and that the united *foci* of those cones, which must be considered as coming from all quarters of the expanse, would constitute its general focus.

In some such disposition, and state of things, as here represented, it is conceivable, that the system-light, transmitted to the expanse through its atmosphere, might be reflected from those segments ; and for the most part converge in cones towards a general focus : where, by means of the refraction and separation, it had undergone in that transmission and reflection, it would be, in each cone, arranged or classed, according to the different refrangibility and reflexibility of its rays. After the rays had past the boundary of their focus, they would intersect each other, and form new and reversed cones, or conic

D d 2

figures :

any extra-central direction ; and that this may be affirmed of every two opposite parts or segments in the whole surface of the expanse. The effect of the atmosphere, in regard to the refraction, is not here noticed. These rays, like the sun's rays at the earth, are considered as parallel, by reason of the great distance of the radiant bodies, and the consequent extreme minuteness of the angle of divergence at such a distance.

figures : in which each sort of the coloured rays, as before the interfection, would generally be together; and in that associated state, continually diverge in proportion to their distance from the line of interfection.

But perhaps the whole of this effect, the classification of the rays, may be caused by the reflecting power of the expanse : which, in that case, would receive the rays in the same mixt state as the direct solar light comes to the earth : with respect to which, we know that it frequently undergoes a classification by reflection, as well as by refraction.

In either case, as the three most refrangible, and reflexible classes, at a proper distance from the focus, are not to be distinguished from each other, but all appear blue : and as the blue, at that distance and beyond it, doth therefore possess so large a portion of the interior space of the expanse, it is conceivable, that many systems may be so placed, as to be on all sides in the direction of the rays of that colour ; and to which the whole expanse would, for that reason, appear blue.

With respect to the earth, it is probably so situated as to be in all parts of its orbit, principally within the limits of such classes as are composed of the blue rays ; and partly within the verge of classes, whose rays, by reason of their imperfect separation being in a mixed state, exhibit a brighter light. The predominant colour, therefore, of the expanse, as it respects the earth, is blue ; with interspersions of a brighter light, such as the Milky Way, and other lucid parts of the expanse : whose irregular appearance, in the Milky Way, may be owing (as hath been already suggested) to the particular construction and configuration of its parts : the brightness of which seems to intimate

intimate some peculiarity in their constitution, and in the circumstances attending them.

Nature thus exhibiting, on a broad scale, phenomena, which our little experiments can exhibit only in miniature; and of which those experiments sometimes lead to a happy explanation.

Whether the foregoing be such an explanation; or wholly chimerical, in reference to the colour of the expanse, does not affect the expanse itself: whose existence, considered as an all-surrounding orb, may be real, although the assigned cause of its colour be demonstrably without foundation.

From the several phenomena above-mentioned, unless the evidence supposed to arise from them be futile, or inadmissible, there is reason to conclude, that an all-surrounding orb does really exist; and that the blue expanse is that orb.

It is an observation of Sir *Isaac Newton*, “that the main business of natural philosophy, is to argue from phenomena, without feigning hypotheses; and to deduce causes from effects, till we come to the very first cause, which certainly is not mechanical; and not only to unfold the mechanism of the world, but chiefly [among others that are mentioned] to resolve these, and such like questions, viz. Whence is it, that the sun and planets gravitate towards one another, without dense matter between them? and what hinders the fixt stars from falling upon one another?”\*

Agreeably to the foregoing observation, the author of this memoir having adduced certain phenomena, he hopes not impertinently, has endeavoured, not only to argue from them, and to deduce the cause from the effects, but to resolve that great question

\* Opticks. p. 344. 4th edit. 8vo.



question concerning the fixt stars, and the heavenly bodies in general, namely, What hinders them from falling upon one another, and thereby involving the whole in ruin ?—Whether his endeavours have been successfully applied, those who are conversant in subjects of this nature, are best qualified to judge.

In regard to the subject in hand, there seems to be a happy co-incidence between phenomena and scripture ; and, therefore, in further evidence of such an orb, and in evidence of several other orbs similar, and concentric to it, we may recur to scripture : several passages of which appear applicable to that purpose.

It seldom happens that natural philosophy is made to borrow assistance from thence ; but though scripture may not be intended to instruct us in the philosophy of material nature, it may nevertheless give, and be intended to give, some hints of its constitution, or general system.

As the passages referred to, do not need any laboured comments, a very few observations will suffice to explain and apply them.

A remarkable one, and which may serve, in some measure, to elucidate the rest, is this passage, “ It is God that buildeth his stories in the heavens.”\* In the *English* translation, which agrees with the *French*, with the *Latin* of *Castellio*, and of *Tremellius* and *Junius*, the marginal reading, referring to stories, is spheres and ascensions. The former explanatory of stories : the latter, another word for the *Hebrew* ; and which answers to the *Greek* of the *Septuagint*. All which, both separately and together, give the idea of a succession of concentric spheres, ascending one above another, like the stories of a magnificent building :

\* *Amos*, ch. ix. 6.

Building : and, agreeably to that idea, though on very different principles, perhaps those of the *Ptolemeian* system, the text has been explained.\*

This construction, which appears to be a natural one, gives a meaning to the text,—a meaning illustrative of the omnipotence of the Architect : and, at the same time it elucidates some other texts relative to the subject, it is perfectly descriptive of the concentric spheres, or orbs, above-mentioned.

The same idea is intimated in the short account given of the creation by *Moses*, who seems to refer to two firmaments.—The first he mentions is limited to the earth and its atmosphere ; and the other is that in which the fixt stars do appear.

It is this latter, that is here to be considered : concerning which, “ God said, let there be lights in the firmament of heaven ;” and concerning which it is declared, that “ God set those lights in the firmament.”||

The radix of the *Hebrew* word, translated firmament, “ is applied to God’s spreading out the sky ; to the firmament, or spacious

\* Qui ædificat in cœlo (in supremis cœlis) ascensiones suas—sphaeras suas—gradus suos : i. e. orbes coelestes, qui sunt velut gradus ; unus supra alterum.

Poli synopsis in loc.

|| Gen. ch. i. v. 14. 17.

Mr. *Whiston*, whose explanation of the *Mosaic* account of the creation is natural, and in general seems to be just, makes no distinction of firmaments : which, however, he might have made, without injuring his theory ; and which his own rules of interpretation would have justified.

The upper firmament, or blue expanse, in which the heavenly bodies were “ set,” he might have included, together with them, in the work of the fourth day, or year, as it was rendered visible at the same time, by means of the earth’s atmosphere, in that year, becoming transparent : which atmosphere, according to his theory, is the lower firmament, or expanse. He supposes, the earth had no rotation about its axis until the deluge ; and, therefore, that its annual revolution round the sun, would occasion the antediluvian day to be exactly commensurate with the year.

spacious extension, which is spread abroad between the earth and the clouds : *as also to that other firmament*, or spacious extension, which is above the clouds, where the heavenly bodies are placed.”\*

The original word † means, not only firmament, but expanse, or spacious extension. In the *English* translation, and also in the *Greek* of the *Septuagint*, it conveys the idea of something firm and solid. Some other translations adopt the other acceptance of it. It seems to include both ; and in that case means something solid, and spaciouſly extended.

This explication of the term, connected with the appearance of this firmament, or expanse, gives us the intimation of a solid and spaciouſly extended orb, or sphere : and answers to one of the stories, which God built in the heavens.

“ The heavens ‡ declare the glory of God : and the firmament sheweth his handy-work.”—Here is a clear distinction between the heavens and the firmament. By the former, are meant the heavenly bodies ; and by the latter, the firmament, or expanse, in which they appear.

The same observations may be applied to this, as have been applied to the foregoing passage.

Another, and more descriptive of such an orb, is the following one : “ Hast thou spread out the sky : which is strong, and as a molten looking-glass :”|| or, as a mirror made of polished

\* *Taylor's Hebrew Concordance*, root 1826.

† The author of this memoir, being unacquainted with *Hebrew*, speaks of its meaning by information only.

‡ *Pſalm* xix. 1. Cælum hoc ſtelliferum. Poli Syn.

|| *Job* xxxvii. 18. An expandiſti cum eo (eum adjuvando) æthera, vel cœlos, vel firmamentum ? Hoc græci vocant ſtereōma quod—firmum ſit, et ſuâ ſe velut

virtute

Elished metal. The forementioned *French* and *Latin* versions, and the *Greek* of the *Septuagint*, do, in this passage, all concur with the *English*, in representing the sky as strong, firm, and solid. The *Septuagint* especially, expresses this idea with peculiar force ; as doth also the *Hebrew* original : which, in this place, resembles the sky to a *speculum*, or mirror, “ made of polished metal.”\*

“ The elegant simile of the mirror cannot be understood without recollecting, that their looking-glasses (or mirrors) were made of metal highly polished.”†

This description shews the sky to be, not only firm and solid, but remarkably adapted to reflect light ; and so far intimates the cause, why it is visible. The sky here, as the firmament in a former clause, corresponds to one of the stories, which God built in the heavens.

There are other passages, which mention the spreading out, and stretching out, of the heavens ; and this as declarative of the discretion, the understanding, the wisdom, and power of God. But if it be a mere appearance, arising from the atmosphere-vapours, in a particular state reflecting to us the blue rays of light ; or if it be a mere circumstance attendant on, or resulting from, the atmosphere ; and doth not indicate the real ex-

E c

istence

virtute contineat, nullâ re nitens. Æthera, vel cœlos—quî solidissimi—quî sunt fortes : item sicut speculum fusum, sive concretum.—Cœlos, quibus *firmitas* tribuitur Prov. viii. 28. unde poetæ cœlum vocârunt kalkeon ouranon. Specula fusa intellige ex ære vel chalybe.—Vox *fortes* soliditatem denotat.—Cœlum,—solidissimum ut simul cohæreat. Poli Syn.

\* Fusum, firmum, validum, instar fusi et consistentis metalli. *Taylor's Hebrew Concordance*, root 783. 26.

† *Scott's Book of Job*, p. 354.

istence of what is declared to be thus spread or stretched out, it is then, in a comparative view, but an inferior instance of wisdom and power : by no means such an instance of them as to entitle it to be mentioned in the climax, in which it is found : much less to be the head, or principal member, of it.

The following, which is one of those passages, and in the sense of which the aforementioned versions concur with the *English*, will shew the climax.—“ He hath made the earth by his power : he hath established the world by his wisdom ; and hath stretched out the heavens by his understanding.”\*—The earth, including its atmosphere—the world, or heavenly bodies collectively—the stretched-out heavens, or blue expanse. This remarkable climax, ascending in dignity and importance, shews, that the last and principal member of it, the expanse, is not only distinct from the earth, and the whole system of heavenly bodies, but that it surpasses them in excellence ; and that it is the capital, among the works of the visible creation. The description of it, and its rank in the climax, indicate, that it is the same firmament or expanse, above-described ; that the same observations are applicable to it ; and therefore, that this, and the parallel passages alluded to, may be adduced in further evidence of its existence ; and, consequently, of the existence of an all-surrounding orb.

The same idea is held forth in a part of the address of wisdom in Prov. viii. 27—29 : the sense of which may be expressed in the following translation ; which differs from the common *English* translation, no further than the apprehended sense of the text makes necessary. A few explanatory notes are interspersed, by way of illustration,

Wisdom

\* Jer. ch. li. 15.

Wisdom speaking, says,—verse 27. “ When God prepared the heavens [the whole system of visible nature] I was present. When (with respect to the heaven) he set an orb around the superficies of the depth [the immense space included within the orb : in reference to which, that space may be justly called the depth] : v. 28. When he gave solidity and strength to (that orb) the sky above ; and when he established its fountains of waters [its interior and exterior atmospheres] : v. 29. When (with respect to the terraqueous globe) he gave to the sea his decree, that its waters should not pass their bounds : and when he appointed the foundations of the earth, then I was by him.”

If this translation and illustration, be just, the text, which only gives the great out-lines, or capital parts of creation, strongly impresses the idea, that there is an orb surrounding all visible nature ; that it is strong and solid ; and that it is furnished with an interior and exterior atmosphere : all which is further descriptive of one of the stories, that God built in the heavens.

In support of the translation and illustration here given, I had collected, in a marginal note, a number of authorities from *Pool's Synopsis* : but it being somewhat long, and those who are qualified to judge in the matter, being able to recur to the *Synopsis*, it is omitted.

Beside those authorities, and in further support of the translation, may be adduced the 148th psalm : where are enumerated, in a regular succession, the heavenly bodies, which compose the material system :—the sun, moon, stars, heavens, and waters above the heavens.

The distinct notice there taken of those bodies, and the arrangement of them according to nature, make it probable, that by the heavens (in that passage, as in some others) are intended the orbs, that have been described. And, in regard to the waters above the heavens, they do plainly intimate, that those orbs are each, like the earth, environed by an atmosphere replenished with waters, to answer the same purposes with the atmospheric waters of the earth.—Of that passage, there will presently be occasion to take some further notice.

If some happy genius, well versed in *Hebrew*, and the philosophy of nature, would arrange in due order, and faithfully translate, those parts of scripture, that in any respect refer to the constitution and economy of nature, and this with a view of reconciling them to nature, we should probably find, that scripture philosophy and natural philosophy would mutually illustrate each other. Such a translation and illustration would be a real acquisition to science ; and might lead to discoveries, of which, at present, we can form no idea.

One quotation more, amidst a further number that might be offered, will close the evidence.

“ The heaven, and the heaven of heavens, and the earth also, are the Lord’s.” “ Thou hast made heaven, the heaven of heavens, with all their hosts : the earth, and the seas, and all things in them.” “ Praise him, ye sun and moon, ye stars, ye heavens of heavens, and ye waters above the heavens.”\*

There are other passages of like import : but these containing all the varieties of expression I have observed concerning the material heavens, or system of nature, may be thought sufficient.

That

That the material heavens are here intended, there can be no room to doubt, as they are mentioned in connection with the earth—with their hosts—with the earth and seas, and the things contained in them—with the sun, moon and stars—and with the waters above the heavens. They are evidently considered here as forming, in conjunction with those other bodies, one vast system; whose several constituent parts are, in the last clause of the quoted text, ranged in the order, in which it is natural to speak of them; and in which, reckoning from the centre of our solar system, they do in reality exist.

Here is a plain discrimination between the heaven; the heaven of heavens; and the heavens of heavens: which must imply some essential difference between them. To suppose the contrary is to confound language, and involve it in uncertainty. It would be to suppose those expressions void of meaning; and would be treating scripture with the indecency, to which no other book, appearing to be dictated merely by common sense, would be entitled. Those expressions, then, necessarily imply some essential difference in the objects of them: and what that difference is, the quotation from *Amos* points out. The gradation, respecting the heavens, is remarkable; and without recurring to any thing else, suggests the idea of stories in them, orb beyond orb, as above explained. The series too, in which they are mentioned—the sun, moon, stars, heavens, and waters above the heavens—and the place they hold in the series, suggest the same idea: which is strengthened and confirmed by the express declaration, that in fact there were such stories built by the Almighty: or, as it is otherwise expressed, that “he made them with all their hosts.”



The last member of the series is the waters above the heavens. These waters, arguing from analogy, seem to indicate, and to be descriptive of atmospheres, that surround those orbs, amply provided, like our atmosphere, with waters, and other elements, proper for the support of animal and vegetable life ; and for other important purposes.

The number of those stories, or concentric orbs, seems indefinite. The gradation clearly denotes a plurality of them : each having its hosts—its suns and planets, or systems. The ample spaces between them, like the space infolded by the orb, to which we more immediately belong, are beautified by those glorious bodies, which, within each of the orbs, constitute systems innumerable, serving the like noble purposes, which our solar system is calculated to serve, and doth serve.

The foregoing passages of scripture thus interpreted, appear to agree, in their result, with the phenomena above-mentioned ; and, like them, to be naturally, and without force, applicable to the purpose, for which they were produced. Such agreement, it is apprehended, shews the propriety and fitness of the interpretation : as, on the other hand, a disagreement with phenomena would prove the unfitness or falsity of any interpretation ; and manifest it to be totally inadmissible.

When scripture and phenomena thus agree, they mutually elucidate each other ; and, in that case, what is deducible from the one, is confirmed by the other. As, therefore, those passages agree with the phenomena, they both together corroborate the evidence, which each afforded separately, of the existence of an interior orb.

With respect to the exterior orbs, the evidence for them must rest on scripture. There can be no phenomena, from  
which

which to deduce their reality : unless the aperture, or gap aforementioned, with what it discloses, be admitted as such.

The phenomena, exhibited through that aperture, are indeed remarkable ; and may indicate an exterior orb, or the bright region between that, and the orb, which more immediately surrounds us : in which bright region, as well as in some other of the lucid spaces in the expanse, there seems to be an uninterrupted and perpetual day.

If in fact there be such an aperture, the same appearances with those, from which it was deduced, may indicate other apertures in the other lucid spaces, and in the Milky Way : for the ascertaining of which, the observations of the ingenious Mr. *Herschell*, with his largest magnifiers, should he think proper to apply them for that purpose, might happily conduce.

Among the purposes, for which those apertures were intended, if they really exist, this may be one,—to give to the *intra-orbic* and *trans-orbic* systems some intimation of each other, and of their mutual relation ; and to afford them a glimpse of the grand complicated system, of which they are parts.

The immensity of those orbs doth not invalidate their existence : on the contrary, immensity is so congenial to our ideas of the Creator, and his works, that it affords, as applied to those orbs, an internal presumptive proof of their reality.

On the supposition of their existence, what an assemblage of glorious bodies do they exhibit ! peopled by an unlimited variety of beings, and arranged in a gradation beautiful and astonishing ! Trace the gradation from the smaller to the larger planets, circling around their sun, and with him forming a magnificent system ! Trace it from that system, through successive systems, to their surrounding orb ! Trace it from orb to

orb, and through their several hosts of systems up to the superior orb, and its ambient atmosphere ! Trace it in every possible direction, from the common centre to the utmost verge of that atmosphere, and the most wonderful phenomena, in a rapture-inspiring succession, strike the mental eye ! impressing the idea of a complete whole, self-balanced, and held in union by universal gravitation ! exhibiting a superlatively grand system of systems, embosomed in the infinite, all-comprehending essence of the Creator !

Grand and magnificent as this system is, there may be another incomparably more so ; composed of myriads of such systems, governed by the same laws, and with it surrounded by an immense orb, to counter-balance the gravitation of the included systems.

That other system may be a part of a still more splendid one, formed on the same plan ; and this latter may enter into the composition of other systems, beyond comparison superior to it : each succeeding system, in a regular progression, rising in dignity and splendour. And thus we may go on, enlarging our idea of those systems, indefinitely.

What is there to check that idea, when we consider the infinity of space, in connection with the infinite wisdom, power and benevolence of the Author of nature ; and at the same time reflect, that infinite space is the proper, and the only adequate theatre for the display of those perfections, and of such a character ?

This hypothesis, by introducing solid orbs, may possibly, on a superficial view of it, be thought a revival of the ancient or *Ptolymean* System, and to grow out of it. But on the contrary, it will be found, upon examination, totally inconsistent with

with it ; and to be in reality the offspring of the new philosophy : derived from the grand principle of that philosophy—universal gravitation.

Upon the whole :—The hypothesis, so far as it relates to the existence of the interior orb, immediately furrounding the visible heavens, the author of it apprehends to be a probable deduction from the principle of gravitation ; and to be deducible also from phenomena and scripture. He offers it for consideration, with the hope, that if it should appear not wholly groundless, it may be productive of a happier illustration.

